## We Claim:

- 1. A semiconductor laser apparatus having a vertical emitter (2) and
- 2 having at least one pump laser (5) for optically pumping the vertical emitter (2),
- 3 with the vertical
- 4 emitter (2) and the pump laser (5) being monolithically integrated,
- 5 wherein,
- during operation, the pump laser (5) has a radiation-emitting zone (6) at a
- 7 first temperature T1 and the vertical emitter has a radiation-emitting zone (3) at a
- 8 second temperature T2, and the first temperature T1 is lower than the second
- 9 temperature T2.
- 1 2. The semiconductor laser apparatus as claimed in claim 1,
- 2 wherein
- the pump laser (5) and the vertical emitter (2) are epitaxially grown on a
- 4 common substrate (15).
- 1 3. The semiconductor laser apparatus as claimed in claim 1,
- 2 wherein
- the pump laser (5) and the vertical emitter (2) are mounted on a common
- 4 mount (1), in particular a heat sink.
- 1 4. The semiconductor laser apparatus as claimed in claim 3,
- 2 wherein
- the thermal resistance between the mount (1) and the radiation-emitting
- 4 zone (6) of the pump laser is less than the thermal resistance between the mount
- 5 (1) and the radiation-emitting zone (3) of the vertical emitter (2).

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| 1 | 5. The semiconductor laser apparatus as claimed in claim 3,                           |
| 2 | wherein   |
| 3 | the vertical emitter (2) and the pump laser (5) are arranged between the              |
| 4 | substrate (15) and the mount (1).   |
|   |   |
| 1 | 6. The semiconductor laser apparatus as claimed in claim 3,                           |
| 2 | wherein   |
| 3 | one mirror layer or two or more mirror layers (4) is or are arranged                  |
| 4 | between the radiation-emitting zone (3) of the vertical emitter (2) and the mount     |
| 5 | (1).  |
|   |   |
| 1 | 7. The semiconductor laser apparatus as claimed in claim 6,                           |
| 2 | wherein   |
| 3 | the mirror layer or the mirror layers (4) is or are formed as a Bragg mirror.         |
| 1 | 2 The comissenductor leaver apparetus as alaimed in claim 1                           |
| 1 | 8. The semiconductor laser apparatus as claimed in claim 1,                           |
| 2 | wherein   |
| 3 | the pump laser (5) has an active layer (16) comprising its active zone (6),           |
| 4 | and the vertical emitter (2) has an active layer (13) comprising its active zone (3), |
| 5 | with the active layer (16) of the pump laser (5) and the active layer (13) of the     |
| 6 | vertical emitter (2) having the same structure and/or the same composition.           |
|   |   |
| 1 | 9. The semiconductor laser apparatus as claimed in claim 1,                           |
| 2 | wherein   |
| 3 | the active layer (16) of the pump laser (5) and/or the active layer (13) of           |

the vertical emitter (2) are/is formed as a quantum well structure.

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| 1 | 15. The semiconductor laser apparatus as claimed in claim 8,                           |
| 2 | wherein  |
| 3 | the active layer (16) of the pump laser (5) and the active layer (13) of the           |
| 4 | vertical emitter (2) are formed jointly in one epitaxy step.                           |
| 1 | 16. The semiconductor laser apparatus as claimed in claim 8,                           |
| 2 | wherein  |
| 3 | the radiation-emitting zone (6) of the pump laser (5) produces pump                    |
| 4 | radiation (9), which is injected into the radiation-producing zone (3) of the vertical |
| 5 | emitter in a direction oblique or perpendicular to the main emission direction of      |
| 6 | the vertical emitter (2).  |
| 1 | 17. The semiconductor laser apparatus as claimed in claim 8,                           |
| 2 | wherein  |
| 3 | the pump laser (5) is formed as an edge emitter.                                       |
|   |  |
| 1 | 18. The semiconductor laser apparatus as claimed in claim 1,                           |
| 2 | wherein  |
| 3 | the vertical emitter (2) is formed as a vertically emitting laser, in particular       |

formed as a VCSEL or a disk laser.